THE CO-OPERATIVE UNIVERSITY OF KENYA
EXAMINATION ACADEMIC YEAR 2024/2025
UNITE CODE & TITLE: BCSC 4126 SIMULATION & MODELING

ASSIGNMENT ONE (1)

INSTRUCTIONS:

- *Attempt all the questions in groups of 4-5 students (No individual submissions)*
- *Submit your answers in a single PDF format file via eMasomo platform (not emailing) – each individual student to submit indicating team members' details on the answer sheet.*
- *Deadline is **8th November, 2024***

Questions

a) Explain why random sampling is necessary in simulation experiments **(4 marks)**

b) Dr. Mkubwa is a dentist who schedules all her patients for 30-minutes appointments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the various categories of work, their probabilities and the time actually needed to complete the work

Category	Time required	Probability
Filling	45 Minutes	0.40
Crown	60 Minutes	0.15
Cleaning	15 Minutes	0.15
Extraction	45 Minutes	0.10
Check-up	15 Minutes	0.20

Simulate the dentist's clinic for four hours and determine average waiting time for the patients as well as the idleness of the doctor. Assume that all the patients show up at the clinic at exactly their scheduled arrival time starting at 10 a.m. Use the following random numbers for handling the above problem: 40, 82, 11, 34, 25, 66, 17, 79 **(6 marks)**

c) Consider a simple server queuing system that starts at time t=0. The arrivals occur at times 1.2, 1.8, 2.6, 3.8, 6.0, 6.2, 7.0, 7.5, 8.6, and 0.2. Departures occur at times 3.0, 4.2, 4.9, 5.6 and 10. Time is in minutes. Simulate this Queuing System until when the sixth client enters
service and estimate: **(10 marks)**

i. The average delay in the waiting line
ii. The average number of clients in the waiting line at any time
iii. The server utilization rate